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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/624,746	07/22/2003	Alastair McIndoe Hodges	104978-0006	6474

21125 7590 07/25/2008

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EXAMINER	
NOGUEROLA, ALEXANDER STEPHAN	
ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
07/25/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/624,746	HODGES ET AL.	
	Examiner	Art Unit	
	ALEX NOGUEROLA	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *6/05/2008 (RCE)*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/981,385.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/05/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Diebold et al. (US 5,437,999) in view of Straus et al. (US 5,089,320) ("Straus"), Kanezawa et al. (US 5,095,407) ("Kanezawa") and "Enthone – Imaging Technologies Update" June 2001/Number 3) ("Enthone"), White US 5,243,516 ("White"), and Denualt et al. "Direct determination of diffusion coefficients by chronoamperometry at microdisk electrodes," J. Electroanal. Chem., 308 (1991) 27-38 ("Denuault") or Daruházi et al. "Cyclic voltametry for reversible redox-electrode reactions in thin-layer cells with closely separated working and auxiliary electrodes of the same size," J. Electroanal. Chem. 264 (1989) 77-89 ("Daruházi").

Addressing claim 1, Diebold discloses an electrochemical biosensor comprising

(1) a hollow electrochemical cell (Figures 5 and 6) for measuring a concentration of glucose in a blood sample, the hollow cell comprising

(a) at least one working electrode (11);

(b) at least one counter or counter/reference electrode (48), wherein the working electrode and the counter or counter/ reference electrode are not coplanar (Figure 5) and a separated by a very small distance (implied by Figure 5 and related passages, which disclose thin layers);

(c) a spacer (43) interposed between the working electrode and the counter electrode or counter/reference electrode (Figure 5), where the spacer comprises a non-conductive polymeric material (col. 7:14-18 and col. 7:55-57), and wherein the hollow

electrochemical cell has a small effective volume (implied by col. 8:45-50, which discloses that the cell is part of a capillary space); and

(d) a fluid permeable side-wall on at least one side of the hollow cell permitting entry of the sample into the hollow cell (right end of capillary 49 in Figure 5);

Diebold does not mention (1) whether the working electrode in the embodiment of Figure 5 is non-metal, (2) having the working electrode and the counter or counter/reference electrode spaced from about 20 microns to about 200 microns, and (3) having the effective cell volume be less than 1.5 microliters

As for having the working electrode be non-metal, Diebold does broadly disclose providing a non-metal working electrode. Diebold states, "A working, counter, or reface electrode element may be produced in accordance with the present invention as shown in Fig. 1. Electrically conducting material **1** (e.g., a noble metal or carbon) is vacuum sputtered or evaporatively deposited onto thin support material **2** ..." [emphasis added]. See col. 3:50-54. The decision as to whether to use a metal working electrode or a non-metal working electrode was within the skill of one with ordinary skill in the art at the time of the invention. The major factors that would be considered are manufacturing cost for and retail price of the electrochemical cell (noble metals, such as gold and platinum are more expensive than carbon) and desired measurement accuracy (electrical conducitivity of the conductive material for the electrode).

As for the working electrode and the counter or counter/reference electrode spaced from about 20 microns to about 200 microns, Diebold discloses using a MYLAR™ film as a spacer (col. 7:14-18 and col. 7:55-57), but does not disclose the thickness. Diebold also discloses using

MYLAR™ film of approximately 10 mil (254 microns) thickness as an electrode support (col. 5: 62-67), which if not the same MYLAR™ film as used for the spacer is certainly an obvious variant. As shown by Straus, at the time of the invention MYLAR™ film of only 12.2 microns in thickness was commercially available. See col. 4:53-56. The spacing between the working electrode and counter electrode also has a contribution from a second insulating layer (5) over the working electrode and a second insulating layer (34) over the counter electrode. Diebold that these second insulating layers are a solder resists, such as ENPLATE®DSR-3242 (a negative resist). See col. 4:35-48. Product literature from Enthone discloses that ENPLATE®DSR-3242 could be made less than 1.1 mils thick (27.94 microns), for example 0.5 mils (12.7 microns). See Enthone. Also, it was known at the time of the invention to make a negative type photosensitive epoxy-solder resist (ENPLATE®DSR-3242 is such a resist) only 5 microns thick in a printed circuit board, which is clearly related art to Diebold. See in Kanezawa col. 8:9-16. Thus, barring evidence to the contrary, such as unexpected results Applicants' claimed distance between the working electrode and the counter or counter/reference electrode of from about 20 microns to about 200 microns is just a matter of scaling the spacer of Diebold, such as by using the 12.2 micron thick Dupont Mylar film disclosed by Straus and thin second insulating layers as disclosed by Enthone and Kanezawa. A smaller spacer will create a smaller electrochemical cell effective volume, which is consistent with the purpose of Diebold: "A method for fabricating high-resolution, biocompatible electrodes is disclosed, allowing production of an electrochemical sensor which is capable of precise analyte concentration determination on a very small sample size. [emphasis added]."

As for the hollow electrochemical cell having an effective cell volume of less than 1.5 microliters, this is just a matter of scaling the spacer of Diebold. Diebold is directed to a small volume sensor and discloses a cell volume of 3 microns. See the abstract and col. 12:35-42. The spacer, by its thickness and the width of the capillary channel, defines the cell volume in Diebold. See Figure 5. It may be made of a plastic film, such as MYLAR™ film. See Figure 5 and col. 7:14-18 and col. 7:55-57. As noted above, at the time of the invention MYLAR™ film of only 12.2 microns in thickness was commercially available. Diebold also discloses using a laser to from a cutout that defines the capillary channel. See col. 7:14-21. Thus, barring evidence to the contrary, such as unexpected results, having an effective cell volume of less than 1.5 microliters is just a matter of scaling the cell volume in Diebold by using a thin enough spacer, such as using the 12.2 micron thick Dupont Mylar film disclosed by Straus, and/or creating a narrow enough capillary channel by using thin enough laser beam.

Diebold also does not disclose providing "means for measuring from cell current the diffusion coefficient of a redox mediator in the cell and independently its concentration."

Denuault discloses means (algorithm, computer program) for measuring from cell current the diffusion coefficient of a redox mediator in the cell and independently its concentration. See the abstract and the Theory section on pages 29-32.

Daruházi also disclsoes means (algorithm) and a method for measuring from cell current the diffusion coefficient of a redox mediator in a thin-layer cell and independently its concentration. See the fourth full paragraph on page 87.

It would have been obvious to one with ordinary skill in the art at the time of the invention to provide the means taught by Denuault or Daruházi in the invention of Diebold

because then the accuracy of the measurements will be increased. Diebold discloses making measurements with a meter adapted to apply an algorithm to the current measurement, such as taught by White. See col. 13:09-26 in Diebold. The algorithm of White calculates the Cotrell current. However, it assumes that the diffusion coefficient of the redox mediator is constant. See in White col. 04:27 – col. 05:14 and col. 01:67 – col. 02:25 (D is subsumed in the constant "K"). Since Denuault's and Daruházi's means will allow the diffusion constant to be actually determined, it would have been obvious to one with ordinary skill in the art at the time of the invention that Denuault's and Daruházi means will thus allow White's algorithm to more accurately determine the Cottrell current. Moreover, Denuault's means (algorithm, computer program) and method

- uses chronamperometer, so it can be readily adapted to the measurement system of White, which measures current;
- directly determines the diffusion coefficient of an electroactive species, "... does not require knowledge of the bulk concentration and the number of electrons participating in the electrode reaction, and requires only a value for the disk radius,";
- allows "[s]ubsequent determination of the number of electrons (n) for an electrode reaction or the concentration of electroactive species ...";
- is a simple, accurate and rapid technique; and
- in some circumstances allows the concentration (when *n* is known) to be estimated without calibration standards.

See the abstract and Conclusion on page 38.

Addressing claim 2, as discussed in the rejection of claim 1 Diebold discloses a carbon working electrode.

Addressing claims 3 and 4, Diebold states, "A working, counter, or reface electrode element may be produced in accordance with the present invention as shown in Fig. 1. Electrically conducting material **1** (e.g., a noble metal or carbon) is vacuum sputtered or evaporatively deposited onto thin support material **2** …" [emphasis added]. See col. 3:50-54. So, barring evidence to the contrary, such as unexpected results, whether to use a noble metal for the counter electrode and a nonmetal for the working electrode is just a matter of optimizing the electrochemical cell (sensor), while minimizing cost.

Addressing claim 6, as stated in the rejection claim 1 above, "The spacer [of Diebold, which is to be used in the invention of claim 1 of copending Application No. 10/624,746] forms a hollow cell and a fluid permeable side-wall on at least one side of the hollow cell permitting entry of the sample into the hollow cell."

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Diebold et al. (US 5,437,999) in view of Straus et al. (US 5,089,320) ("Straus") Kanezawa et al. (US 5,095,407) ("Kanezawa") and "Enthone – Imaging Technologies Update" June 2001/Number 3) ("Enthone"), White US 5,243,516 ("White"), and Denualt et al. "Direct determination of diffusion coefficients by chronoamperometry at microdisk electrodes," J. Electroanal. Chem., 308 (1991) 27-38 ("Denuault") as applied to claims 1-4 and 6 above, and further in view of Carter et al. (US 5,126,034) ("Carter"), Daruházi et al. "Cyclic voltametry for reversible redox-electrode reactions in thin-layer cells with closely separated working and auxiliary electrodes of the same size," J. Electroanal. Chem. 264 (1989) 77-89, and Bohs (US 5,399,256).

As for the metal being silver, since Diebold discloses that the metal may be a noble metal this is just optimization. In fact, Diebold discloses a counter electrode comprising silver (col. 12:43-55). Ag/AgCl was a common counter/reference electrode composition at the time of the invention. As shown by Carter and Bohs the combination of a non-metal (carbon) working electrode and a silver counter/ reference electrode is not novel. See Figure 1 and col. 2:28-48 in Carter and Figure 5; col. 2:62- col. 3:5;and col. 7:50-53 in Bohs.

As for chloride ions in the blood sample, the type of sample is intended use that does not appear to further structurally limit the electrochemical cell. In a any event, Diebold discloses directly measuring blood (col. 12: 35-42) and blood contains various chloride salts, such as NaCl or KCl.

Search Reports

6. The Supplementary European Search Report for Application Number EP 96937919 lists US 5,437,999 A as an "X" reference against claims 1-20, 22-27, and 30-51, and as a "Y" reference against claims 28 and 29; Daruhazi et al. J. Electroanl. Chem. Vol. 264, no. 1-2, pp. 77-89, as an "X" reference against claims 1, 4, 20, 22, 30, 32, 33, 35, and 44-47; EP 0351891 A as an "X" reference against claims 1, 4, 13, 16, 20, 33, 35, 39, 42, 44-46; Patent abstracts of Japan vol. 010, no. 149 (P-461) as an "X" reference against claims 1, 2, 4, 13, 20, 22, 30, 33, 34, 36, 39, 44-46; Patent abstracts of Japan vol. 010, no. 124 (P0454) as an "X" reference against claims 1, 4, 20, 33, 34, 44, and 45; and EP 0359831 A as a "Y" reference against claims 28 and 29.

Only claims 1-6 are pending in the instant application. US 5,437,999 A and Daruhazi were applied in rejections above against claims 1-6 under 35 U.S.C. 103(a). None of the other references listed as "X" or "Y" references disclose "means for measuring from a cell current a diffusion coefficient of a redox mediator in a cell and independently its concentration" as required by claim 1.

7. The European Search Report for Application Number EP99202305 lists US 4,654,197 A as an "X" reference against claims 1-7, and as a "Y" reference against claim 8; and EP 0359831 A as a "Y" reference against claim 8.

Only claims 1-6 are pending in the instant application. Both US 4,654,197 A and EP 0359831 A differ from the invention of claim 1 of the instant application at least because neither reference discloses "means for measuring from a cell current a diffusion coefficient of a redox mediator in a cell and independently its concentration" as required by claim 1.

8. The International Search Report for International Application No. PCT/US02/31289 lists US 6,284,125 B1 as an "X" reference against claims 14, 15, 17, 20-26, 32, and 33, and as a "Y" reference against claims 16, 18, and 19; WO 0020626 A as an "X" reference against claims 14, 15, 17, 20-26, 32, and 33, and as a "Y" reference against claims 16, 18, and 19; and US 5,120,420 A as a "Y" reference against claims 16, 18, and 19.

Only claims 1-6 are pending in the instant application.

US 6,284,125 B1 does not qualify as prior art against the instant application because the instant application claims priority from the application, 08/981,385, from which US 6,284,125 B1 issued.

WO 0020626 A does not qualify as prior art against the instant application because the instant application has priority back to at least June 19, 1996, which is earlier than any priority date listed on the face of the WO 0020626 A document.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX NOGUEROLA whose telephone number is (571) 272-1343. The examiner can normally be reached on M-F 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NAM NGUYEN can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Alex Noguerola/
Primary Examiner, Art Unit 1795
July 20, 2008